Pomeroy Ranger District
Umatilla National Forest

UPPER PATAHA PROJECT

— SOILS —

Categorical Exclusion Resource Considerations

Proposed Action

Commercial timber harvest and non-commercial thinning would be used to manage stand density, structure, and species composition in project units totaling approximately 2,200 acres. A majority of the units would be treated using ground-based equipment; the rest would be skyline or hand thinning units.

Disposal of slash created by harvest operations would be accomplished by burning landing piles, and possibly by grapple piling slash within units. Imminent and likely danger trees along haul routes would be removed. All work would be done utilizing existing road systems and the construction of approximately 1 mile of temporary roads; temporary roads will be obliterated following use.

Required Design Features

The following design features are required to ensure compliance with the regulatory framework for this resource and/or to reduce the risk of adverse impacts to this resource. A description is provided as to when, where and how the design feature should be applied and/or what conditions would trigger the need to apply the design feature.

1. Retain as much duff as possible, while meeting fuel reduction objectives to control erosion and provide organic matter.

   Anticipated Effectiveness: Duff slows surficial water flow which slows or stops surficial erosion by water. Duff also protects the mineral soil from wind erosion. Removal of duff results in increased surficial water erosion and wind erosion resulting in a thinner soil profile. Even one inch of duff can slow erosion by rain and stop wind erosion holding surficial soil in place. If duff is removed, woody debris or slash can perform the same function as duff but to a slightly lesser effectiveness.

2. Pile fuels (both hand and machine piles) on sites already disturbed by logging activities (old skid trails, and landings). Refrain from fuel piling above or below culverts or in drainages. Limit pile size to less than a normal landing area. For landscape and pile burning, maintain 20 percent or less soil exposure on slopes greater than 35%.

   Anticipated Effectiveness: Reuse of already disturbed areas in the project unit doesn't add to detrimental soil conditions resulting from mechanical treatment activities. Keeping burn areas away from drainages and culverts limits the amount of exposed hydrophobic soil, which is more susceptible to erosion, in areas where surficial water is directed for flow out of the activity unit. Limiting pile size

helps maintain smaller unconnected disturbed areas that have less a chance to transport soil out of the activity unit. Large disturbed areas can concentrate surficial flow resulting in greater soil erosion. Disturbance on areas on steep slopes (> 35%) double or triple the potential of soil erosion by wind and water. Maintaining a soil exposure of less than 20% keeps disturbance areas disjointed.

3. Keep fire line construction to minimal standards needed to complete prescribed burning. As needed, place water bars for all fire lines. Seed all fire-lines after project completion. Reclaim machine-built fire lines by redistributing displaced topsoil and unburned woody debris over the disturbed surface. Install water bars on fire-lines, temporary roads, and skid trails with spacing indicated as follows: Gradient <5% and spacing 200ft; gradient 5-10%, spacing150ft; 10-20% gradient, 100ft spacing; 20-40% gradient, 50ft spacing; >40% gradient, 25ft spacing. Water bars should be cut at an angle of 30-40 degrees and depth of 12-18 inches.

   Anticipated Effectiveness: Fireline and water bar construction exposes mineral soil in a continuous pattern across a slope. Continuously exposed soil has greater potential of concentrating rain which results in greater soil erosion forming rills and gullies. Larger areas of mineral soil exposure also result in increased wind erosion removing sand, fine sand, and silt/volcanic ash deposits. Because most of the project area is mantled by fine sand and silt volcanic ash erosion will be associated with activities that leave connected areas of mineral exposure. Maintaining water bars at intervals that are most effective at limiting water velocity relative to increasing slope keeps erosion disjointed and at a minimum.

4. Yarding should be spaced for optimum efficiency and minimum soil disturbance. Forwarder trails should average 50 feet apart, except where converging. Maintain skid trail spacing average of 100 feet. Avoid yarding activity on shallow soils commonly associated with convex-convex areas identified by the following plant associations: bluebunch wheatgrass-Sanberg bluegrass (GB41), green fescue (GS11), Idaho fescue-bluebunch wheatgrass (GB59), Cold Shallow 13+ P.Z. (R009XY022OR), and Cold Shallow South 13+ P.Z. (R009XY036OR).

   Anticipated Effectiveness: Maintaining yarding, forwarder activity, and skit trail activity at the indicated spacing will help in maintaining soil disturbance below forest plan standards of less than 20 percent detrimental soil conditions. Any activity on shallow soils (> 50 cm thick to bedrock) is detrimental to soil productivity resulting in soil compaction that is difficult to restore after disturbance. All disturbance on shallow soils contributes to the 20 percent detrimental soil condition of a unit. Rock content of shallow soils limits mitigation to ripping only. Compaction and ripping result in decreased soil water holding capacity causing the area to be droughty which are prime conditions for areas of surficial flow concentration, ponding, and newly formed habitat for invasive plants (weeds).

5. Utilize low ground pressure equipment and existing trail system and landings as much as possible. To limit detrimental soil disturbance within commercial harvest units, low ground pressure equipment (less than 8.5 pounds per square inch [psi]) can be allowed off trails on dry, snow-covered, or frozen soil conditions. All other heavy equipment should remain on trails and roads.

   Anticipated Effectiveness: Low pressure equipment disperses equipment weight over a larger area minimizing focused compaction by equipment. Preferentially using existing system travel ways with

low pressure equipment limits new disturbance and does not add to increasing soil compaction. Soil displacement is limited or eliminated when preferred soil moisture conditions are followed, dry or frozen soil.

6. Avoid ground equipment operations in a parallel manner to slope on slightly concave areas of the landscape that receive ephemeral flow as a result of snow melt or rain fall (draws). Activities that are perpendicular to slope or flow are acceptable in a limited extent when the soil is dry or frozen.

   Anticipated Effectiveness: Activities that create ruts where ephemeral flow occurs on slightly sloping upper reaches of mountains or broad slightly sloping plateau areas cause channeling of surficial water which result in increased soil erosion. Ruts can also result in dewatering of the soil profile at a faster rate than under natural conditions ultimately changing the development of soil in that area and shifting to a different, possibly undesirable, plant association. This can result in changes in vegetation, water holding capacity, and ultimately slowing soil development and lowering productivity.

7. Operate ground based equipment when soil conditions are dry, frozen, or snow covered enough to support machinery adequately (Refer to Soil Moisture vs. Texture Operability document). If possible, operate on a bed of slash (>12 inch thick) to mitigate soil compaction and displacement on all soils. Dry soil conditions are when surface horizons between 2 to 6 inches of the soil surface are dry. When slash mat availability is less than 12 inches dry soil conditions are recommended.

   Recommendations for machine operation during winter activities include: 15 cm of frozen ground 8 cm of frozen ground with 25 cm of settled snow; 50 cm or more of snow; 25 cm of slash mat in combination with 35 cm of settled snow; or moisture conditions acceptable for minimizing rutting or puddling of soils.

   Indicators of cold weather condition failure include: machine break-through begins to occur; equipment tracks sink half the width of the track below the soil surface with one or two passes; ruts greater than 15 cm deep form in the soil; mid-day temperatures rise above freezing; surface melt occurs over existing frozen surfaces.

   Use of harvest or mastication equipment should be limited or halted when soils reach moisture field capacity to limit the potential of long-term detrimental soil disturbance.

   Anticipated Effectiveness: Ground based activities on soils with conditions that are wet result in increased potential for soil displacement (rutting) or soil compaction. When activities are performed during identified soil conditions (dry, frozen, or snow covered) soil compaction and displacement are eliminated or minimized. Any detrimental soil conditions associated with activities during suggested conditions require less mitigation than activities that occurred under wet conditions.

8. Forwarders need to ride on a slash mat with a minimum depth of 12 inches, if available. If less slash is available, operations must occur after the soil is obviously dry (based on appearance and feel, at a 2 to 6 inch depth) or frozen, and must make the slash mat as deep as possible. Refer to Soil Moisture vs. Texture Operability document.

Anticipated Effectiveness: Slash matts help displace the weight of heavy mechanical equipment. The more slash a harvester travels on the less impact equipment has on soil compaction. Soil structure is more resistant to compaction when in a dry condition. The combination of a slash mat and dry or frozen soil condition provide the best circumstance to avoid excessive soil compaction and displacement.

9. Retain sufficient slash/biomass material to provide organic matter and nutrients commensurate with existing technical recommendations after project activities.

   Anticipated Effectiveness: Forest soils require a sufficient amount of decomposing litter, duff, twig/branch/trunk biomass to remain productive and maintain the proper soil acidity associated with different vegetative communities. Too much woody debris on the soil surface can decrease soil productivity almost immediately until the biomass decomposes enough to return soil production to normal. Too little biomass results in a decrease of soil productivity over time.

10. Use of ground-based skidding or forwarding equipment on slopes exceeding 35% should be limited to short pitches on mountain backslopes. Where slopes are greater than 35%, single passes with felling equipment are acceptable. It would be preferable if singles passes could be done over slash, but it is not required. If additional passes are necessary, they must be done over a minimum of 8 inches of slash. Greater activity on steep slopes requires vehicle features or equipment to minimize track or tire slippage limiting focused pressure by the equipment to gain traction on steeper slopes. Appropriate equipment for steeper slopes is encouraged. Directional felling or winching is recommended for use where necessary.

    Anticipated Effectiveness: [Quantitative or qualitative explanation of how effective the design feature is likely to be based on past experience and/or monitoring.] Activity on steep slopes (slopes >35%) is associated with greater potential for erosion and soil displacement. Activity on short pitches is intended as traverses for access to broader less sloping pitches or minimal activities. Ashy soils in activity units mostly indicate that compaction potential by single passes without slash is moderate. Using slash on all slopes decreases the sevierity of compaction. Slash can move a moderate rating closer to a low rating. More activity than single passes on slopes greater than 35% can displace and compact soils almost double the detrimental soil conditions found on lesser slopes. Steeper slopes cause tracks or tires to focus presure on the down hill area of the contact point placing the full weight of the vehicle on a significantly smaller area. Equipment that uses teathered logging systems or independent axles helps to limit focused presure on soil which minimizes soil compaction and displacement.

11. Mechanical thinning equipment in non-commercial thinning units may be used provided that equipment exceeding 7 PSI <u>not travel</u> over the same pass more than once. It is recommended that all mechanical thinning equipment travel over slash.

    Anticipated Effectiveness: [Quantitative or qualitative explanation of how effective the design feature is likely to be based on past experience and/or monitoring.] Limiting commercial thinning equipment to designated spacing aids in maintaining less than 20 percent detrimental soil conditions on the unit. Authorizing non-commercial thinning equipment with a weight that produces PSI greater than 7 on

soils with moderat compaction potential in the rest of the unit only increases detrimental soil conditions throughout the unit resulting in an exceeded limit. Equipment use on slash lowers displacement and compaction potential from moderate towards low with relation to increasing slash thickness.

12. Keep temporary road placement to deep soils as much as possible.

Anticipated Effectiveness: [Quantitative or qualitative explanation of how effective the design feature is likely to be based on past experience and/or monitoring.] Preferential road placement on deep soils (soils 100 cm or thicker to bedrock) allows for easier mitigation than on soils that are shallow. Compaction of deep soils usually occurs within the upper 35 to 50 cm. Ripping or subsoiling detrimental soil conditions in deeper soils is more feasable than in shallow soils (less than 50 cm thick). Roads in deep soils return to preactivity conditions faster after mitigation than shallow soils. Disturbance of shallow soils has a greater potential of supporting invasive vegetation than deeper soils because of limited water holding capacity due to soil thickness (less than 50 cm thick to bedrock) and rock fragment content (35 to 60 percent and 60 to 85 percent). These soil characteristics are favorable to the following plant associations: bluebunch wheatgrass-Sanberg bluegrass (GB41), green fescue (GS11), Idaho fescue-bluebunch wheatgrass (GB59), Cold Shallow 13+ P.Z. (R009XY022OR), and Cold Shallow South 13+ P.Z. (R009XY036OR). Compaction to shallow soils causes them to become increasingly droughty resulting in areas only suitable to invasive plant species (weeds). Mitigation on compacted areas can be performed but due to the rock content of the soils ripping the area is the only option and results in droughty soil which is ideal for invasive plants.

13. Install drainage if temporary roads remain over-winter, subsoil if needed, pull berms into roadbed, revegetate with native seed, mulch with existing slash, and camouflage entrance to discourage use.

Anticipated Effectiveness: [Quantitative or qualitative explanation of how effective the design feature is likely to be based on past experience and/or monitoring.] Once thinning activities have ceased in the unit, any subsequent vehicle activity by ATVs, UTVs, or SUVs (vehicles) stop all mitigation efforts and start compaction and soil displacement again.

14. Avoid operating on shallow soils usually located on convex-convex areas or are usually identified by the following plant associations: bluebunch wheatgrass-Sanberg bluegrass (GB41), green fescue (GS11), Idaho fescue-bluebunch wheatgrass (GB59), Cold Shallow 13+ P.Z. (R009XY022OR), and Cold Shallow South 13+ P.Z. (R009XY036OR). Avoid using these soils for landings or skid trails unless over frozen ground/snow, unless no other location is practical. If use is necessary disturbance will be kept to a minimum amount of the area, preferably at the edges of these features. Restorative actions, such as scarifying, seeding, mulching and/or adding nutrients, such as biochar would be used to improve soil productivity. Activity unit 23 has 40 out of approximately 100 acres that are shallow soils. Unit 55 has 14 acres of 81 acres that are shallow soils. Unit 62 has 3 acres of 9 acres that are shallow soils. 4 of 15 acres in unit 92 are shallow soils. Unit 92 has 4 of 17 acres that are shallow soils.

Anticipated Effectiveness: [Quantitative or qualitative explanation of how effective the design feature is likely to be based on past experience and/or monitoring.] Shallow soils (<50 cm to bedrock) are

identifed as sensitive soils because they are most susceptible to compaction and displacement with fewer options for mitigation. If shallow soils are used and detrimental soil conditions are present, subsoiling is not possible usually due to soil thickness and high rock fragment content. Ripping the area would result in excessive erosion and just as much soil productivity reduction to desired vegetation as use.

15. For parts of a skyline unit less than 44 percent slope, if planned logging system, is changed from skyline to ground based, this change will be implemented only if a soil scientist or hydrologist determines that cumulative DSCs would remain below 17 percent.

Anticipated Effectiveness: [Quantitative or qualitative explanation of how effective the design feature is likely to be based on past experience and/or monitoring.]

Cause-Effect Relationship

After considering the proposed actions, to include the design features that would be applied, does the proposed action cause an effect on your resource? List the cause-effect relationship(s) that pertains to your resource.

If a cause-effect relationship would have existed but is eliminated by application of a design feature, you could clarify this *if you believe it would provide helpful context for the Responsible Official's decision rationale.*

Remember, identification of cause-effect relationships should also consider comments received during the scoping period. ***Avoid hypothetical discussions of possible effects*** *that cannot be clearly tied to actions being proposed and their impact on the resource.*

[List and describe the cause-effect relationship of the proposed action on your resource.]

Ground based logging activities result in detrimental soil conditions such as soil displacement, soil compaction, and soil erosion. Skyline logging activities minimize ground disturbance but can result in the same detrimental soil conditions. Soil displacement by vehicle rutting and sheet or rill erosion thins the soil profile resulting in decreased soil productivity. Creation of roads and fire lines also displaces upper soil horizons resulting in decreased soil productivity. Design features 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, and 15 are used to limit or negate the effects of these activities.

Soil compaction results from temporary road creation, landing use, feller-buncher activities, skidding, and skyline activities. Soil compaction reduces soil productivity by degradation of soil structure and function by reducing water infiltration in to the profile and available water capacity in the upper 30 to 50 cm of the profile. Design features 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, and 14 are used to limit or negate the effects of theses activities on the landscape.

Fuel reduction activities by burning can result in mineral soil exposure and increased hydrophobic properties of the immediate soil area. Inoculating piled slash and burned landing areas is not financially and logistically feasible for most areas. Seeding does occur under certain circumstances after pile burning. Design features 1, 2, 3, 4, and 9 are used to limit or negate the effects of these activities on the landscape.

Logging activities on slope greater than 35 percent can result in increased soil displacement and erosion. Potential for soil erosion due to slope is greatest in activity units 6, 14, 57, 58, 60, 62, 64, 88, 159, and 163 (soil map units 5019CO, 5776CN, and 6014CS) which are comprised of approximately 50 percent or more slopes greater than 35 percent. The total area exceeding 35 percent slope is approximately 10 percent of the total activity area based on the soil survey map unit descriptions slope class. Majority of the project area, 90 percent, occurs on slopes less than 35 percent. Design features 2, 3, 5, 7, 10, and 11 are used to limit or negate the effects of activities on slopes less than 35 percent. The same features minimize detrimental soil conditions on slopes greater than 35 percent.

WEPP Analysis of the entire watershed excluding effects by roads and existing skid trails resulted in an average annual delivery from channel outlet for years 1-30 suggests a moderate risk of soil productivity and watershed degradation. Application of BMPs and PDCs will reduce the risk to low for most of the areas treated in the project area and no risk for areas not being treated.

	From outlet	Per unit area of watershed
Total contributing area to outlet	6800 acres	
Precipitation	870000000 ft^3/yr	35 in/yr
Water discharge	330000000 ft^3/yr	13 in/yr
Total hillslope soil loss	4.5 ton/yr	1.3 lb/acre/yr
Total channel soil loss	52 ton/yr	15 lb/acre/yr
Sediment discharge	16 ton/yr	4.6 lb/acre/yr
Sediment delivery ratio for watershed	0.275	
Average Annual Sediment Discharge from Outlet	16 ton/yr	

Regulatory Framework

The proposed action has been reviewed and is determined to be in compliance with the management framework applicable to this resource. The laws, regulations, policies and Forest Plan direction applicable to this project and this resource are as follows:

[Describe the laws/regs/policies and Forest Plan direction that guide and/or constrain the decision space for this resource and the actions proposed.]

Forest Service Manual 2520 Pacific Northwest Region (R6) supplement no. 2500.98-1 provides direction for the management of soils within activity areas to which supports the National Forest Management Act of 1976. The 1976 Act and other legal mandates are use manage National Forest System Lands under ecosystem management principles without permanent impairment of land productivity and to maintain or improve soil and water quality. Region 6 quality standards are thresholds beyond which soil quality is adversely impacted. To meet standards 80 percent of the activity area must be left in an acceptable soil quality condition. Umatilla National Forest Land and Resource Management Plan (Portland, OR : USDA Forest Service, Pacific Northwest Region, 1990) provides guidance on desired soil productivity which restricts detrimental soil conditions to less than 20 percent of the project area, maintain a minimum ground cover, avoid activities that could trigger mass movements, and limitations to fire line activities.

Best Management Practices (BMPs) in the National Core BMP Technical Guide (USDA, Forest Service. 2012. National Best Management Practices for water quality management on National Forest System Lands. Vol. 1: Natl. Core BMP Technical Guide. FS-990a, April 2012. 165 p.) and Region 6 BMPs (USDA, Forest Service. 1988. General water quality Best Management Practices. Pacific Northwest Region, November 1988. 118 p.) and Project Design Criteria (PDC) are incorporated into the design and analysis of effects to ensure relevant natural resources are managed and protected consistently with policy, law, and regulation. BMPs and PDCs also serve to ensure implementation of Proposed Action activities are properly performed.

Extraordinary Circumstances

No extraordinary circumstances need to be considered for this resource.

Description of the Spatial and Temporal Bounds used for Effects Analyses

Describe the rationale for determining the temporal bounds (time period) and spatial bounds (area considered in the analysis) used for the effects analysis. ***You may have different spatial/temporal bounds based on the different cause-effect relationships (or species).***

Spatial Boundary

[Description of rationale for spatial bounds. If different boundaries apply based on cause-effect/species, specify that.]

The project area is generally limited to sub-basins leading to the larger Pataha Creek basin. Discontinuous activities in the project area limit effects to sub-basins and when the potential for activities to connect the application of PDCs and BMPs keeps the disturbed areas separated resulting in no cumulative effect. Effects are mostly localized to 10 to 100 feet from disturbance as a result of PDCs and BMPs.

Temporal Boundary

[Description of rationale for temporal bounds. If different boundaries apply based on cause-effect/species, specify that.]

Most of the effects will occur directly after project activities are performed. Once soil disturbance stops soil forming processes can resume to stabalize the soil profile. Soil stabalization starts after slash or mulch is spread over the soil, roads and temp roads are stabalized or removed, and when vegetation starts growing in the disturbed area. Effects are mostly stabalized within the first 6 months to a year after a project and improve with time when PDCs and BMPs are followed. Soil stability and producitivity increases with increasing time.

Cumulative Effects

Remember, if you do not have any direct/indirect effects, there will be no cumulative effects.

Past, Present & Reasonably Foreseeable Actions

Projects implemented in the past 10 years:

- 2008 Non-Commercial Thinning and Fuels Reduction Project
- 2014 Non-Commercial Thinning Project
- School Fire Salvage
- Loop Road Salvage

Current, ongoing uses and permits:

- Peola Allotment

Reasonable Foreseeable Future Projects (likely to be implemented in the next 5 years and may contribute to cumulative effects with this project):

- None

Reuse of existing roads, landings, and reactivity of temporary roads will immediately increase and add to existing soil compaction and displacement for these activity areas. The amount of soil amelioration present on the landscape currently after the last project in the area will be negated as current activities commence. Ground based logging activities will immediately add to existing detrimental soil conditions from past activities. If activities follow suggested BMPs and PDCs soil displacement and compaction can be returned to pre-2019 activity levels within 5 to 10 years. Approximately 23 percent of the total project area will be effected by proposed logging activities. Of the activity area about 2 percent is on slopes greater than 35 percent and has the greatest potential for detrimental soil conditions the remaining 98 percent of the proposed activity areas have a low risk to detrimental soil conditions. So, effects are immediate but short lived and not extensive. Cumulative effects are none.

Brien Park, Forest Soil Scientits, Watershed Program Manager

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